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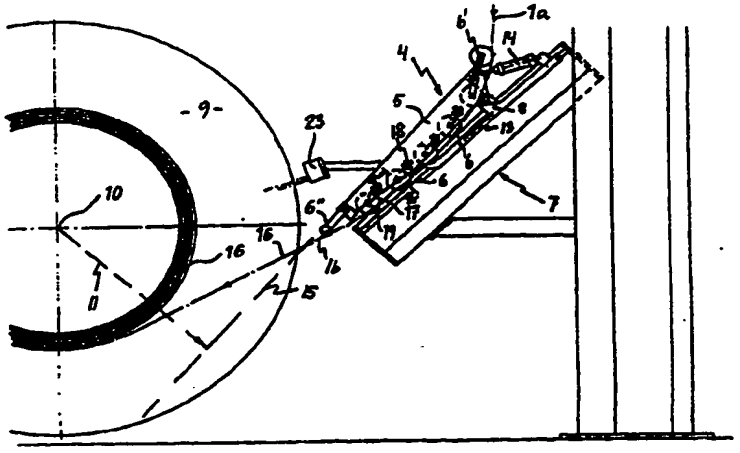

(57) Abstract

The invention relates to a guiding unit for controlling the winding process when winding or unwinding a line (1), e.g. a cable, a rope, a wire or the like, preferably an electrical cable, onto or from a reel (9) provided with a central hole, which guiding unit (4) can execute a reciprocating movement relative to the reel (9) and parallel to the axle (10) of the reel (9) for the purpose of producing uniform winding turns (16), and the guiding unit (4) comprises an arm which at its one end is secured in an articulated manner in a stand, and a conveyor track arranged along the arm, the line (1) being intended to run along the arm in contact with and guided by the track. The arm has a rigid frame (5) extending in the track direction, which frame (5) has a number of rotatable guide rollers (6, 6') which are movable relative to the frame, in the main transversely to the frame, and which are arranged to bear against and guide the line (1). Resilient members (18) are arranged to act on the guide rollers (6, 6') in such a way that the guide rollers (6, 6') and the line (1) bear against each other with a certain force.

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GUIDING DEVICE FOR WINDING OR UNWINDING A LINE, E.G. A CABLE OR A ROPE, ONTO OR FROM A REEL.

The present invention relates to a guiding device for controlling the winding process when winding or unwinding a line, e.g. a cable, a rope, a wire or the like, preferably an electrical cable, onto or from a reel provided with a central hole, which guiding device can execute a reciprocating movement relative to the reel and parallel to the axle of the reel for the purpose of producing uniform winding turns. The guiding device comprises a pivotable arm which at its one end is secured in an articulated manner in a stand, and a conveyor track arranged along the arm, the line being intended to run along the arm in contact with and guided by the track.

Guiding devices of the type mentioned are already known from, inter alia, US-A 4,421,284, US-A 2,141,934 and GB A 1328542. All these have flexible arms incorporated in the guiding device, besides which the two US patents mentioned additionally have an extremely complicated and thus expensive construction.

The Applicant's own Swedish patent application 8601484-2 also exhibits a flexible arm with many articulations, which means that the arm does not satisfy the demands in respect of rigidity for the accurate functioning which is required.

The guiding devices mentioned do not react to small vibrations in the line, which can consist of a round or flat cable, and this means that the guiding device is not sufficiently responsive to movements of the line. A guiding device with good rigidity, responsive contact and guidance, and smooth and jolt-free running is particularly important as far as the manipulation and winding up of fibre optic cables is concerned. It is therefore important that the number of guide rollers can be varied and that the guiding unit is displaceable and can be set to different positions for different reel sizes.

According to the invention, a simple and with it inexpensive guiding unit with good functioning is obtained by means of the fact that the arm has a rigid frame extending in the track direction, that the frame has a number of rotatable guide rollers which are movable relative to the frame, in the main transversely to the frame, and which are

has a number of rotatable guide rollers which are movable relative to the fram , in the main transversely to the frame, and which are arranged to bear against and guid the line, and that resilient members are arranged to act on the guide rollers in such a way that the guide rollers and the line bear against each other with a certain force.

An efficient guiding device is obtained by means of the guide rollers being supported at the one end of articulated arms inclined towards the track, the other end of which articulated arms is mounted in the rigid frame, preferably by means of an axle, which is arranged at the said other end of the articulated arm, being supported by an elastically deformable element arranged in a seat formed in the frame.

The elastically deformable element can consist of leaf springs, screw springs or other springs, but it is advantageous that the resilient element can consist of a rubber bushing and is preferably designed such that the resilience of the rubber element is progressive and adjustable, either individually for each guide roller or jointly for all the guide rollers. This can be achieved, for example, by means of the fact that the said seat can be given an individual rotational displacement or that all the seats are coupled together, for example mechanically, so that they have the same presetting.

In order to obtain a good winding of the line, it is advantageous that the frame can be pivoted about its pivot hinge, preferably by means of a power device such as an electric or hydraulic positioning device, in a plane essentially perpendicular to the reel axle, preferably in the vertical plane, in order to set the radial distance between the centre axle of the reel and the continuation of the longitudinal extent of the frame for the purpose of obtaining a gentle path for the line in towards the layers wound onto the reel.

For an efficient guiding of the lin , it is advantageous if the guid r llers hav , at their outer edg s, flang s angled slightly towards the hub.

In one embodiment of the guiding device according to the invention, the guide rollers are arranged only on the underside of the frame. It is similarly advantageous if the guide rollers, in a plane perpendicular to the axle of the reel, give the track a curvature with a centre of curvature which lies on the same side of the track as the reel axle, i.e. is convex in the same direction as the cable wound onto the reel.

In order further to facilitate the winding process, the set-up in one embodiment of the invention is such that the frame, in addition to being pivotably connected to the stand, can also be displaced relative to the stand in the longitudinal direction of the frame.

The invention will now be described in detail for purposes of illustration and in connection with an embodiment in which a cable issuing from an extruding machine is wound onto a reel.

Figure 1 is a diagrammatic side view of the said installation,

Figure 2 is an enlarged partial view of the device in Figure 1, including the guiding unit and the reel with layers of cable wound on,

Figure 3 is a cutaway view through a guide roller, with assembly details, in the section III-III in Figure 2,

Figure 4 is a cutaway view through a guide roller, and

Figure 5 is a section through an elastically resilient device in the section V-V in Figure 3.

Reference number 1 in Figure 1 denotes a line in the form of a cable which has just been extruded in the finished state from a production line. The cable is led to an accumulator and stretching-force regulator 2 over a vertically movable and force-loaded head 3 which, by means of an upwardly directed force, holds the cable 1 stretched. When the cable is fed out from the extruding device mor quickly than it is wound onto the re 1, th upwardly force-load d head 3 will move upwards and in this way accumulate the excess cabl length which has

been fed out. When th cable is wound on more quickly than the extruding speed, the difference in length will be taken up by m ans of the movable head 3 dropping down.

The cable part 1a runs into the guiding unit, which is designated as a whole by 4. This unit will be described in greater detail in conjunction with Figure 2. To the far left in Figure 1, a receiver is shown which is denoted by 12 and which includes a reel 9 having an axle 10. The receiver is provided with drive machinery for rotation of the reel for winding-on of the cable part 1b issuing from the guiding unit 4.

Reference number 7 in Figure 2 designates a stand which can be a part of the device 2 and relative to which stand the whole guiding unit 4 can be displaced in a reciprocating movement, as has been indicated by the double arrow 13. The thereby displaceable attachment has a pivot hinge 8 for a rigid, elongate frame 5, which preferably has a cross-section in the form of an inverted U profile. By means of the action of a positioning device 14, which can be electrically, hydraulically or pneumatically driven, the frame 5 can be pivoted about the pivot hinge 8. Reference number 15 designates a line of continuation of the length of the frame 5, which line is at a radial distance, designated by 11, from the axle 10 of the reel. It is obvious that the radial distance 11 can be altered and set to the desired value by the action of the positioning device 14 so that the cable part 1b can be given a direction which is favourable for the winding of the cable 16 onto the reel 9.

A number of guide rollers are arranged in the displaceable and pivotable, rigid frame 5. The cable part 1a entering the guiding unit runs into the guiding unit via a first guide roller 6' and is led in a gentle curve over a further five guide rollers, designated by 6. The part 1b runs out from the guiding unit via a small roller designated by 6'' and is wound onto the reel 9.

The suspension mounting and the functi ning of the guide roller 6'' ar clear from Swedish patent application 8601484-2.

Finally, reference number 17 in Figure 2 designates the articulated arms which at their ends support roller axles 19 for rotatable m unting of the guide rollers 6, 6', and also a resilient element 18. Reference number 20 designates an articulated arm axle which is secured to that end of the articulated arm 17 remote from the guide roller and which is supported in the resilient element 18.

Figures 3 and 4 show in more detail the design of the guide rollers and their resilient suspension. Thus, reference number 5 in the figure designates the flanges of the rigid frame, 6 designates the guide roller and 19 the axle about which the guide roller rotates. The axle is secured, by means of a screw connection, on one end of the articulated arm 17, which at its other end has an articulated arm axle 20.

Figure 5 shows a section through the resilient element 18. The articulated arm axle 20 consists of a square tube which is surrounded by an outer seat 21, likewise in the form of a square tube. The two square tubes 20 and 21 are offset relative to each other by an angle of rotation of 45° so that the corners of the square tube 20 lie at the centre of the sides of the square tube 21. Elongate rubber elements 22 are pressed into the four spaces between the corners of the square tube 21 and the sides of the square tube 20, so that the articulated arm axle 20 can turn relative to the seat 21 with compression of the rubber elements 22, a progressive resiliency arising in this way. The seat 21 is connected firmly to the rigid frame 5, for example by means of the seat being screwed or welded securely in the upper flange 5, as has been shown in Figure 3.

Figure 1 shows that the stretching-force regulator 2 generates a tensile stress in the cable part 1a which is propagated through the guiding unit to the winding-on part 1b for winding onto the reel. By virtue of the fact that the cable inside the guiding unit 4 has a gentle c nvex path, all the guide rollers 6' and 6 will be acted up n by a f rce in such a way that they piv t

inwards into the frame 5 and generate a bearing force between guide roller and cable. By means of the smoothly configured cable path and the low weight of each guide roller, the guide rollers will exercise a responsive contact with the cable so that a very efficient and controlled guiding of the latter is obtained. The fact that the guide rollers are provided, at their ends, with flanges 24 whose inner side is slightly angled inwards towards the rotation axle of the guide roller, as is shown in Figure 4, also contributes to an efficient guiding of the cable.

Figure 2 shows that the cable path inside the guiding unit 4 has a gentle curve shape, with the centre of curvature obliquely upwards to the left in Figure 2. This means that the cable here has the same curvature as when being wound onto the reel. This can be expressed in another way by saying that both the cable path inside the guiding unit 4 and the cable in the wound-on layer 16 on the reel are convex in the same direction.

In conclusion, it may be said, in conjunction with Figure 2, that reference number 23 designates sensor members, for example in the form of photocells, which are firmly connected to the rigid frame 5, thus moving parallel to the axle 10 of the reel between the flanges of the reel. The sensor members detect the end positions close to the two flanges where the axial winding direction os to be reversed.

It is obvious that, within the scope of the attached patent claims, the invention can be given a configuration other than that which has been described above by way of example. Thus, the guide rollers 6 mounted elastically in the rigid frame 5 can be given a linear movement which is essentially perpendicular to the cable path and which can give rise to a linearly or progressively increasing resiliency. It is important for the invention that the movable, resilient parts are of low weight so that the guide rollers are responsive to the movements of the cable.

PATENT CLAIMS

1. Guiding unit f r controlling the winding process when winding or unwinding a line (1), e.g. a cable, a rope, a wire or the like, preferably an electrical cable, onto or from a reel (9) provided with a central hole, which guiding unit (4) can execute a reciprocating movement relative to the reel (9) and parallel to the axle (10) of the reel (9) for the purpose of producing uniform winding turns (16), and the guiding unit (4) comprises an arm which at its one end is secured in an articulated manner in a stand, and a conveyor track arranged along the arm, the line (1) being intended to run along the arm in contact with and guided by the track, characterized in that the arm has a rigid frame (5) extending in the track direction, in that the frame (5) has a number of rotatable guide rollers (6, 6') which are movable relative to the frame, in the main transversely to the frame, and which are arranged to bear against and guide the line (1), in that each one of the guide rollers (6, 6') is assigned a separate resilient member (18) which acts on the guide rollers (6, 6') in such a way that the guide rollers (6, 6') and the line (1) bear against each other with a certain force.

2. Guiding unit according to Claim 1, characterized in that the guide rollers (6, 6') are supported at the one end of articulated arms (17) inclined towards the track, the other end of which articulated arms (17) is mounted (18) in the frame, preferably by means of an axle (20), which is arranged at the said other end, being supported by an elastically deformable element (18) arranged in a seat (21) formed in the frame (5).

3. Guiding unit according to Claim 2, characterized in that the resilient element (18) can consist of a rubber bushing (22) and is preferably designed such that the resilience of the resilient element (18) can be set either individually for each guide roller (6, 6') or jointly for all the guide r ll rs (6, 6').

4. Guiding unit according to any one or more of the preceding claims, characterized in that the frame (5) can be pivoted about its pivot hinge (8), preferably by means of a power device (14) such as an electric, hydraulic or pneumatic positioning device, in a plane essentially perpendicular to the reel axle (10), preferably in the vertical plane, in order to set the radial distance (11) between the centre axle (10) of the reel (9) and the continuation line (15) of the longitudinal extent of the frame (5) for the purpose of obtaining a path for the line (1) in towards the layers (16) wound onto the reel (9).

5. Guiding unit according to any one of the preceding claims, characterized in that each guide roller (6, 6') has, at its outer edge, flanges (24) angled inwards towards its rotation axle.

6. Guiding unit according to any one or more of the preceding claims, characterized in that the guide rollers (6, 6') are arranged only on the underside of the frame (5).

7. Guiding unit according to the preceding claims, characterized in that the guide rollers (6, 6'), in a plane perpendicular to the axle (10) of the reel (9), give the line track (1) a curvature with a centre of curvature which lies on the same side of the track as the axle (10) of the reel (9), i.e. is convex in the same direction as the cable (16) wound onto the reel.

8. Guiding unit according to any one of the preceding claims, characterized in that the frame (5), in addition to being pivotably (8) connected to the stand (7), can be displaced (13) relative to the stand (7) in the longitudinal direction of the frame (5).

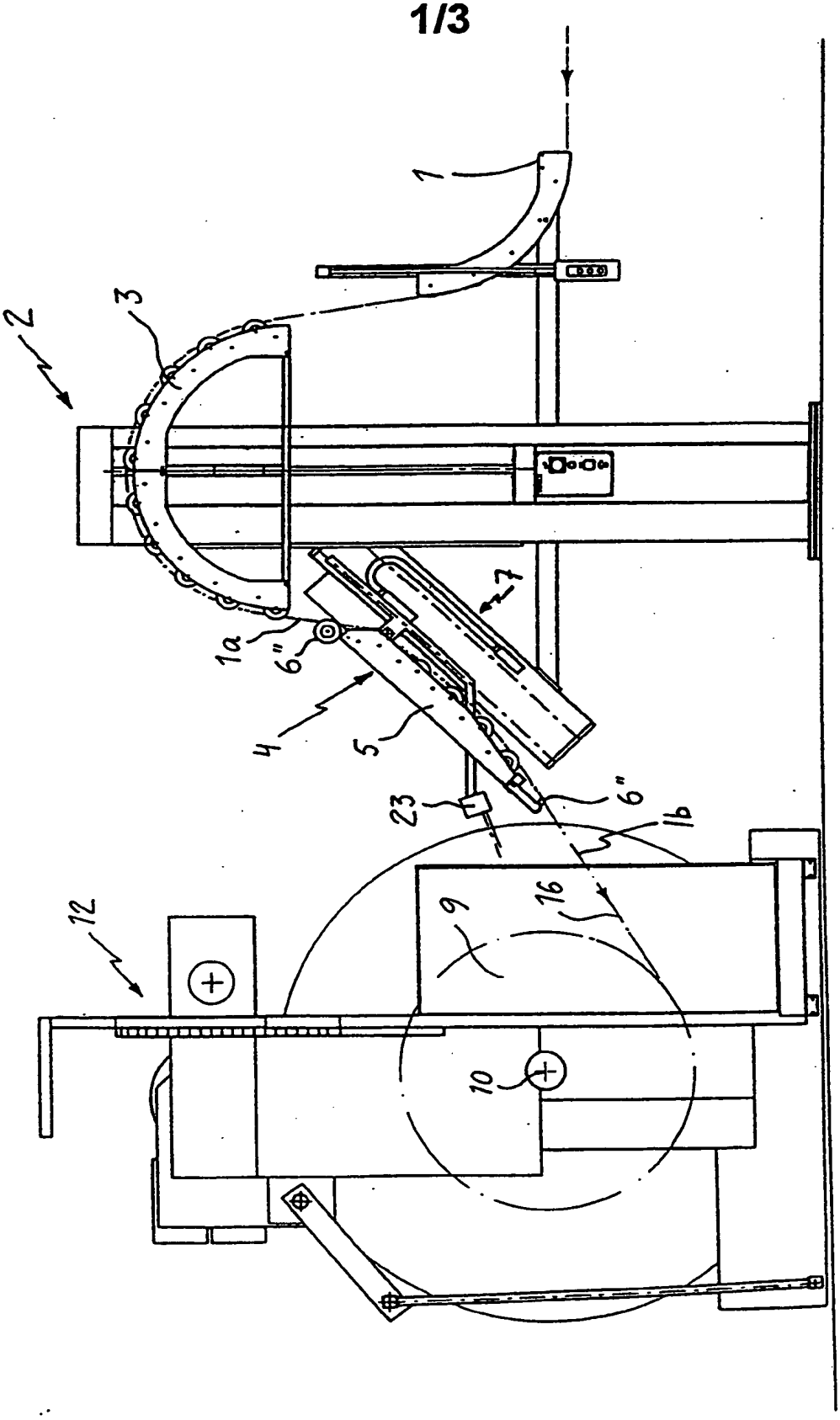

Fig. 1

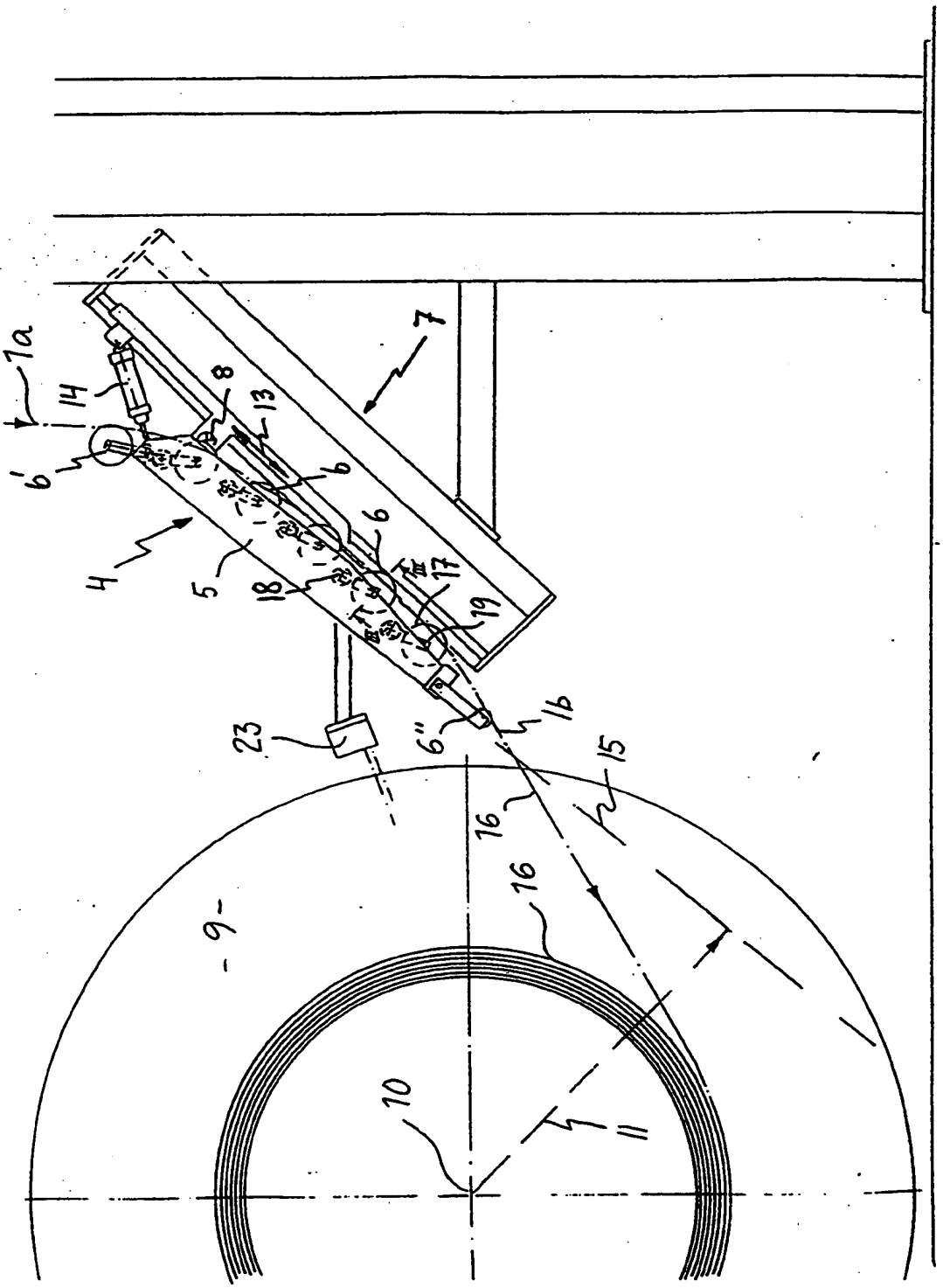

Fig. 2

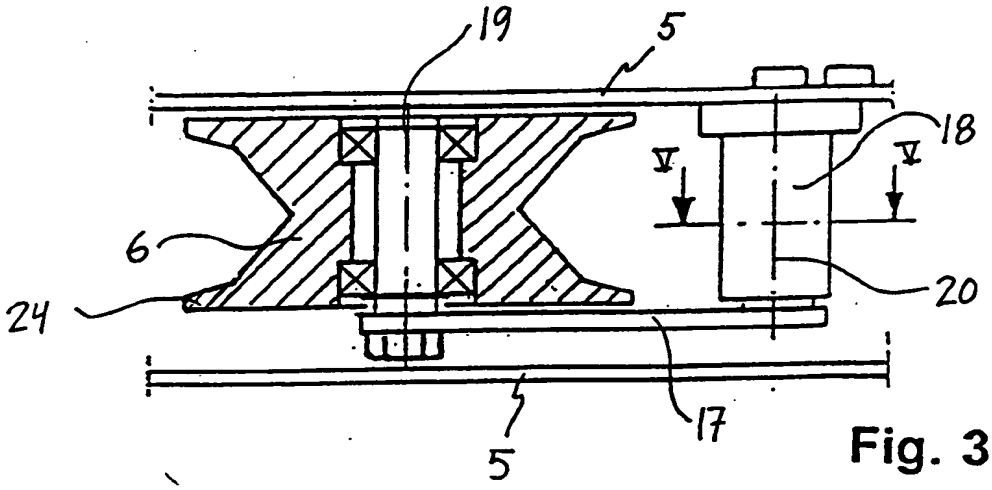

Fig. 3

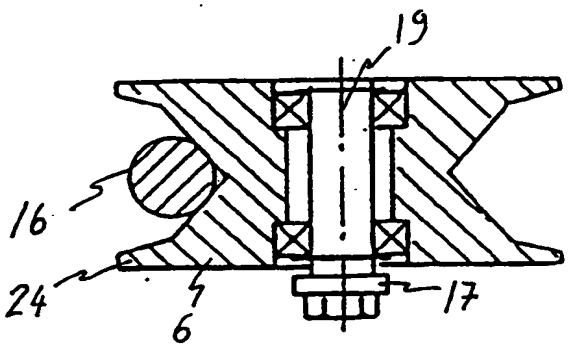

Fig. 4

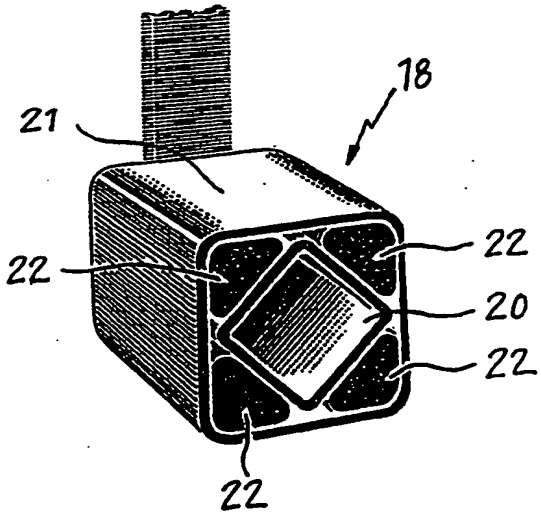

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 94/01227

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B65H 54/28
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B65H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP, A2, 0203046 (SKALTEK AB), 26 November 1986 (26.11.86), page 3 - page 5, figures 1-3	1-8
A	US, A, 4421284 (NORTHERN TELECOM LIMITED), 20 December 1983 (20.12.83), column 5, line 49 - column 6, line 9, figure 9	1-8
A	GB, A, 1328542 (BRITISH INSULATED CALLENDER'S CABLES LIMITED), 30 August 1973 (30.08.73), page 2, line 105 - line 130; page 3, line 1 - line 62, figures	1

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP, A2, 0147619 (OY NOKIA AB), 10 July 1985 (10.07.85), figure 1, abstract -- --------	1

INTERNATIONAL SEARCH REPORT

Information n patent family members

09/02/95

International application No.
PCT/SE 94/01227

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GB-A- 1328542	30/08/73	NONE	
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		JP-A- 60188274	25/09/85
		US-A- 4592521	03/06/86